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ECHINODERMATA

COMPILED BY

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**Atzelius, B.** Electron microscopy of the sperm tail. Results obtained with a new fixative. *J. Biophys. & Biochem. Cytol.* **5** : 269-278 2 pls. 1 fig.

**Agrell, I. (1).** The structure of the chromatine in the pronucleus and the syncarion of the sea urchin egg. *Ark. Zool.* **12** : 95-98 1 pl. 1 fig.

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**Aketa, K. & Tomita, H.** Oxidative phosphorylation by a cell-free particulate system from unfertilized eggs of the sea urchin, *Hemicentrotus pulcherrimus*. *Bull. mar. biol. Sta. Asamushi* **9** 1958 : 57-58.

**Alcala, A. C.** Sea urchin eggs: their use in the laboratory with notes on *Tripleneustes gratilla* (Linn.). *Silliman J.* **4** 1957 : 192-195 3 pls.

**Allen, R. D.** *see* Roslansky, J. D.

**Allen, R. D. & Bunim, L.** Changes in cytoplasmic structure following fertilization in *Arbacia* eggs. *Biol. Bull. Woods Hole* **117** : 403.

**Ancona-Lopez, A. A.** Sôbre holotúrias do litoral sul Brasileiro. *Bol. Fac. Filos. Cienc. Univ. S. Paulo*, no. 223 *Zool.* **21** 1958 : 1-53. [Portuguese with English summary.]

**Anderson, J. M. (1).** Regeneration of pyloric caeca in starfishes. *Anat. Rec.* **134** : 526.

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**Ando, S.** On fucose in the sea urchin egg. *Bull. mar. biol. Sta. Asamushi* **9** 1958 : 55-56 2 figs.

**Andrade, M. M. de & Andrade, J. B. M. de.** Estado actual dos conhecimentos sobre a paleontologia de Angola (até fins de 1955). *An. Jta. Inv. Ultramar, Lisboa* **12** Tom. 4 1957 : 5-209.

**Bäckström, S. (1).** Changes in ribonucleic acid content during early sea urchin development. *Ark. Zool.* **12** : 339-342.

**Bäckström, S. (2).** Studies on sulphhydryl-containing substances in sea urchin embryos of various developmental trends. *Exper. Cell Res.* **16** : 165-173 3 figs.

**Badillo, L.** Catalogo de especies fosiles del Museo del Instituto Geologico y Minero de España. *Notas Inst. geol. Esp.* **55** : 71-124 50 pls. (Crinoid on p. 88).

**Balavoine, P.** Sur la présence de *Semimetra italica* (Schlüter, 1878) (Comatulidae) dans le Lutétien de Bois-Gonêt (Loire-Atlantique). *Bull. Mus. Hist. nat. Paris* (2) **30** : 525.

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**Baltus, E.** *see* Vincent, W. S.

**Bang, F. B. & Chast, A. B.** The effect of starfish toxin on amoebocytes. *Biol. Bull. Woods Hole* **117** : 403-404.

**Bernstein, G. S. & Black, R. E.** Inhibition of cleavage and development of the sea-urchin egg by 2-deoxy-D-glucose. *Proc. Soc. exp. Biol. Med.* **102** : 531-534.

**Bernstein, M. H.** Functional modifications of sperm structure. *Biol. Bull. Woods Hole* **117** : 433.

**Bismarck, O. von.** Versuch einer Analyse der die Stoffwechselintensität ("Ruheumsatz") von *Asterias rubens* L. beeinflussenden Faktoren. *Kieler Meeresforsch.* **15** : 164-186 9 pls.

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**Booolootian, R. A. & Moore, A. R.** A case of ovotestes in the sea urchin *Strongylocentrotus purpuratus*. *Science* **129** : 271-272.

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**Bougis, P.** Sur l'effet biologique du cuivre en eau de mer. *CR Acad. Sci. Paris* **249** : 326-328 1 fig.

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- Bullivant, J. S.** Photographs of the bottom fauna in the Ross Sea. N.Z. J. Sci. 2 : 485-497 10 figs.
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- Chaet, A. B. & McConnaughey, R. A.** Physiologic activity of nerve extracts. Biol. Bull. Woods Hole 117 : 407-408.
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- Cherbonnier, G. (1).** Echinodermes de la Guyane française (Crinoïdes, Astérides, Ophiurides, Echinides, Holothuriens). (Notes 1-5). Bull. Mus. Hist. nat. Paris 31 : 105-111, figs. 1, 2; 168-172; figs. 3, 4; 261-265, figs. 5-7; 367-372 figs. 8, 9; 440-447 figs. 10, 11.
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- Cooke, C. W.** Cenozoic echinoids of eastern United States. Prof. Pap. U.S. geol. Surv. 321 : 1-106 43 pls.
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- Eppley, R. W. & Lasker, R.** Alginase in the sea urchin *Strongylocentrotus purpuratus*. Science 129 : 214-215 2 figs.
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**Evolution.**—Of the *Micraster* group of fossils, **Nichols (1) & (2).**

**Variation.**—Of holothurian sclerites, **Hampton**; polymorphism of *Ophiotrix fragilis*, **Tortonese (2).**

**Biometrics.**—Of *Micraster*, **Nichols (3).**

## ECOLOGY AND HABITS

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**Behaviour.**—Of echinoid *Evechinus*, **McRae**; response to increased light intensity in *Diadema*, **Millott & Yoshida**; of heart-urchins, **Nichols (1) & (2)**; burrowing habits and 'homing' of sea-urchins, **Sinclair**.

**Communities.**—Animals associated with *Allocentrotus*, **Booolootian** & others; associated with *Ophiotrix* in the northern Adriatic, **Czihak**; benthic communities of Cook Strait, **Hurley**; bottom fauna of inshore fishing grounds off E. Scotland, **McIntyre**; of Ascidian beds in the Bay of Naples, **Parenzan**; of Texas coastal bays, **Parker**; of a Venezuelan island shore, **Rodriguez**.

**Habitat.**—Of deep-water *Allocentrotus fragilis*, **Booolootian** & others; of *Odontaster validus* in Ross Sea shown by photographs, **Bullivant**; of *Ophiotrix* in the northern Adriatic, **Czihak**; of echinoid *Evechinus*, **McRae**.

**Environment.**—Effects of salinity and temperature on plankton, **Suarez-Casabro**.

**Distribution.**—Quantitative distribution of *Echinus esculentus*, **Forster**.

**Economics.**—Old methods of cooking echinoderms in Ambonia, **Engel** from **Rumphius**; poisonous echinoids, **Halstead**; starfishes and *Psammechinus* as enemies of oysters, **Hancock**; food of lemon soles, **Rae**; edible echinoderms of Italian waters, **Sebastio**.

**Techniques.**—Underwater photography, **Bullivant, Czihak**.

**Parasites and Commensals.**—Bryozoa epizoid on *Leptometra*, **Gautier**; rhabdocoel turbellarian in gut of *Strongylocentrotus franciscanus*, **Giese**; *Dendrogaster tasmaniensis*, crustacean parasite in starfish *Allostichaster polyplax*, **Hickman**; ascithoracid parasite in starfish *Nepanthia belcheri*, **Kenny**; Protozoan, rhabdocoel and copepod commensal with *Evechinus chloroticus*, **McRae**; Infusoria in intestines of *Strongylocentrotus droebachiensis*, **Poliarsky & Golikova**.

## DISTRIBUTION

## GEOGRAPHICAL

**Arctic.**—Denmark Strait asteroid, **Madsen (1).**

**North Atlantic.**—Eastern U.S., echinoids, **Cooke**; Atlantic coast of France, **Crisp & Fischer-Piette**; Coney Island, New York, echinoids, **Jakowska**; Brittany, *Paracentrotus*, **Lami**; Dorset, England, *Asterias rubens*, **Lang**; East of Scotland, **McIntyre**; W. Norway, **Tambs-Lyche**.

**Tropical Atlantic.**—Brazil, **Brito**; French Guiana, **Cherbonnier (1)**; Florida, holothurians, **Domantay (2)**;

Gulf of Mexico, **Parker**; Venezuela, **Rodriguez**; Brazil, echinoids and asteroids, **Tommasi**.

**Mediterranean.**—*Thyone*, **Reys**; key to echinoderm larvae of the Mediterranean, **Rose**; Italy, **Tortonese (1).**

**Indo-W. Pacific.**—Red Sea Holothurians, **Cherbonnier (2)**; Fauna list of Holothurians, **Domantay (1)**; New Zealand Asteroids, with key to spp., **Fell**; Great Barrier Reef, **Gillett & McNeill**; ophiuroids in Cook Strait, New Zealand, **Hurley**; New Zealand, echinoid, **McRae**; Japan, **Utinomi**.

**East Pacific.**—The Ekman barrier and Panamanian holothurians, **Deichmann (1)**; California, with key to intertidal species, **Light** & others.

**North Pacific.**—Aleutian Is., **Scheffer**.

**South Temperate.**—S. Brazil, holothurians, **Ancona-Lopez**; S. Atlantic coasts of Africa, echinoids, **Cherbonnier (3).**

**Antarctic.**—Holothurian fauna, **Deichmann (2)**; asteroid, **Fell & Clark**.

## GEOLOGICAL

**Holocene.**—Angola, **Andrade & Andrade**.

**Pleistocene.**—Angola, **Andrade & Andrade**; eastern U.S., echinoids, **Cooke**.

**Pliocene.**—Angola, **Andrade & Andrade**; eastern U.S., echinoids, **Cooke**.

**Miocene.**—Angola, **Andrade & Andrade**; eastern U.S., echinoids, **Cooke**; Trinidad, **Jeannet**.

**Oligocene.**—Angola, **Andrade & Andrade**; eastern U.S., echinoids, **Cooke**; Holstein, N. Germany, holothurians, **Deflandre-Rigaud**; Trinidad, **Jeannet**; Mediterranean region, especially southern U.S.S.R., **Poretskaya**.

**Eocene.**—Angola, **Andrade & Andrade**; France, **Balavoine**; eastern U.S., echinoids, **Cooke**; Trinidad, **Jeannet**; Mediterranean region, especially southern U.S.S.R., **Poretskaya**.

**Paleocene.**—Eastern U.S., echinoids, **Cooke**.

**Cretaceous.**—Angola, **Andrade & Andrade**; Texas, U.S., ophiuroids, **Clark, D. L.**; Angola, **Ferreira Soares (1) & (2)**; Georgia, USSR, **Kotetishvili**; Austria, **Leischner**; E. Serbia, **Mitrović-Petrović**; Portugal, echinoids, **Moura**; Pyrenees, **Souquet**; Sicily, **Stramondo**; Hungary, crinoids, **Szörenyi**; S.E. France, **Thieuloy**; Denmark, **Wind**.

**Jurassic.**—Irregular echinoids, **Jesionek-Szymanska**; Austria, **Leischner**; New Zealand, crinoid, **Speden**.

**Triassic.**—Southern China, crinoids, **Dubatulowa & Shao**.

**Permian.**—Southern China, crinoids, **Dubatulowa & Shao**; Kansas, U.S., ophiuroid, **Hattin**; W. Slovenia and N.W. Jugoslavia, **Ramovič**.

**Carboniferous.**—Southern China, crinoids, **Dubatulowa & Shao**; Indiana, U.S., holothurians, **Gutschick**; Lower Silesia, Poland, **Zakowa**.

**Devonian.**—Pennsylvania, U.S., starfish, **Cramer**; Missouri, U.S., **Koenig & Niewoehner**; N. Africa, **Le Maitre**.

**Ordovician.**—Germany, **Volk**.

**Cambrian.**—Esp. Spain, **Badillo**; S. France, **Cabibel, Termier & Termier**.



## III.—SYSTEMATIC INDEX

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†*Amblypygus* pp. 26–27, with *A. americanus* p. 27 pl. vii figs. 8, 9, *Cooke*.

*Anthocidaris crassispina*, *Utinomi* pp. 115–116 pl. lviii fig. 5.

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†*Cidaris figueirensis*, **Moura** pp. 62-63 text-fig. 1 pl. i figs. 1, 2; *C. Malheiroi*, **Ferreira Soares** (1) p. 19 pl. v fig. 8, (2) p. 149 pl. v fig. 8; *C. pratti* p. 10 pl. i figs. 6, 18, 19, *splendens* pp. 9-10 pl. i fig. 10, *C. sp. aff. splendens* p. 10 pl. i fig. 11, **Cooke**.

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*Echinodiscus auritus*, identity of specimen with two open slits on p. 37 and pl. xiv fig. F of Rumphius, 1705, Engel p. 216 photo 24 fig. 8, also *E. bisperforatus* 'young ones.'

*Echinolampas ovata*, identity of Rumphius' pl. xiv fig. 3, 1705, Engel p. 216 photo 24 fig. 6.

†*Echinolampas* (*Psammolampas*) *kugleri* sp. nov. Oligocene Trinidad pp. 201–203 pl. ii figs. 4–6 pl. ix, *E. (Cypholampas) lycopersicus* pp. 196–197 pls. i, ii fig. 1–3, iii, iv, v and vi, *E. cf. lycopersicus* pp. 197–198 pl. vii figs. 1–3, *E. lycopersicus* var. p. 198 pl. vii figs. 4–6, Jeannot; *Echinolampas* p. 55, with *E. aldrichi* pp. 55–56 pl. xxii figs. 11–13, *appendiculata* p. 56 pl. xxii figs. 5, 6, Cooke.

*Echinometra* p. 25, with *E. licunter* p. 25 pl. vi figs. 1, 2, Cooke; 'Echinometra digitata prima loblonga' of Rumphius 1705, p. 32, I 'most probably' is *Heterocentrotus mammillatus*, Engel pp. 212–213, 'Echinometra digitata secunda l. notunda' Rumphius p. 33, II 'not identifiable with any degree of certainty' pp. 213–214, 'Echinometra setosa' Rumphius p. 35 is type of *Diadema setosum* (Leske), p. 214; 'Echinus saxatilis' of p. 31, II, is probably *Echinometra mathaei* p. 211; *E. mathaei*, Gillett & McNeill pl. xcv fig. 3, Tahara, Okada & Kobayashi p. 169 pl. viii figs. 7, 8, Utinomi p. 116 pl. lviii fig. 7; *E. oblonga*, Alcalá pl. ii.

*Echinoneus cyclostomus*, identity of Rumphius' 1705, pl. xiv fig. D, Engel p. 215 photo 24 fig. 7; *E. cyclostomus* with synonym *Echinus ovalis* Linnaeus 1753, Madsen (2) pp. 168–169 fig. 4 (? holotype of *ovalis*); *E. cyclostomus*, Utinomi p. 118 pl. lix figs. 10, 11.

†*Echinopsis* p. 14 with *E. diatreta* p. 14 pl. ii fig. 8–11, Cooke.

*Echinostrephus aciculatus*, Tahara, Okada & Kobayashi, pp. 169–170 fig. 4, Utinomi p. 116 pl. viii fig. 6.

*Echinotrix calamaria* p. 114 pl. lvii fig. 7, *diadema* pp. 113–114 pl. lvii fig. 6, Utinomi.

*Echinotrix diadema*, probable identity of 'Echinus niger' of Rumphius 1705 p. 31, III, Engel p. 211.

*Echinus acutus*, Cherbonnier (3) pp. 46–48 pl. v figs. C–J pl. vi figs. A–F; 'Echinus esculentus' of Rumphius, 1705, p. 31, I description of *Tripneustes gratilla* but pl. xiii figs. B, C correctly named, Engel pp. 210–211 photo 23 figs. 7, 9, 'E. niger' of p. 31, III probably *Echinotrix diadema* p. 211, 'E. planus' of p. 36, I and pl. xiv fig. G is *Arachnoides placenta* p. 216 photo 24 fig. 3, 'E. saxatilis' of p. 31, II is probably *Echinometra mathaei* p. 211 but pl. xiv fig. A might be *Diadema setosum* photo 23, fig. 15, 'E. sulcatus' of p. 36 unidentifiable but pl. xiv fig. C is presumably *Clypeaster rosaceus* p. 215 photo 24 fig. 4; *E. melo*, Sebastio p. 101 figs. 9, 10.

*Encope emarginata*, Cherbonnier (1) p. 372; *E. emarginata*, pp. 49–50 pl. xvii fig. 5 pl. xviii fig. 1, *micellini* p. 49 pl. xviii figs. 2, 3, Cooke.

†*Encope* pp. 47–48 with key to spp. from eastern U.S., *E. emarginata* Late Miocene (?) to Recent pp. 49–50 pl. xvii fig. 5 pl. xviii fig. 1, *macrophora* p. 48 pl. xvii figs. 1, 2, *micellini* Pleistocene and Recent p. 49 pl. xviii figs. 2, 3, *tamiamiensis* pp. 48–49 pl. xvii figs. 3, 4, Cooke.

*Eucidaris tribuloides* var. *africana*, Cherbonnier (3) pp. 41–43 pl. ii figs. F–O pl. iii figs. A–F; *E. tribuloides*, Tommasi pp. 4–5 pl. i fig. 2; *E. metularia*, Utinomi p. 113 pl. lvii fig. 2.

†*Eupatagus* pp. 88–89, with *E. clevei* p. 89 pl. xli figs. 6–8, *E. (Gymnopatagus)* pp. 89–90, *E. (Gymnopatagus) antillarum* p. 90 pl. xli figs. 1–5, *carolinensis* p. 91 pl. xlii figs. 4–7, *gardnerae* pp. 90–91 pl. xlii figs. 1–3, *ocalanus* pp. 91–92 pl. xlii figs. 8–12, *E. (Brisopatagus)* p. 92, *E. (Brisopatagus) alabamensis* p. 92 pl. xliii figs. 5–11, Cooke.

†*Eurhodia* p. 63, with *E. ? elbana* pp. 64–65 pl. xxvi figs. 9–12, *E. patelliformis* p. 64 pl. xxii figs. 7–10, *rugosa* pp. 63–64 pl. xxii figs. 1–4, *E. (Gisopygus)* p. 65, *E. (Gisopygus) holmesi* p. 65 pl. xxiii figs. 1–5, Cooke.

*Evechinus chloroticus*, all aspects, McRae pp. 205–266 figs. 1–15 pls. xii, xiii.

*Fibularia acuta*, Utinomi p. 118 pl. lix fig. 12.

†*Fibularia* p. 30, with *F. alabamensis* sp. nov. Eocene Alabama, U.S. p. 31 pl. ix figs. 20–22, *tezana* p. 30 pl. ix figs. 15–19, *vaughani* pp. 30–31 pl. ix figs. 23–27, Cooke.

†*Gagaria* p. 17 with *G. chickasawhay* p. 18 pl. iii fig. 18, *mosconi* pp. 17–18 pl. iii figs. 10–14, *salis* p. 17 pl. iii figs. 7–9, Cooke.

†*Galerites vulgaris*, possible identity of Rumphius', 1705, pl. i fig. 8 and ? also 6, 7 and 9, Engel p. 222.

†*Gauthieria* p. 23, with *G. speciosa* p. 23 pl. v figs. 1–7, Cooke; *G. broeckii*, possible identity of Rumphius', 1705, pl. lix fig. E, Engel p. 222.

*Heliocidaris erythrogramma*, Sinclair p. 6 fig.

†*Hemiaster* p. 67, with *H. moscovensis* sp. nov. Paleocene Alabama, U.S. p. 68 pl. xxviii figs. 5–9, *parastatus* p. 67 pl. xxviii figs. 15–20, *stella* pp. 67–68 pl. xxviii figs. 10–14, Cooke.

*Hemicentrotus pulcherrimus*, Utinomi p. 115 pl. lviii fig. 3.

*Heterocentrotus mammillatus*, probable identity of 'Echinometra digitata prima loblonga' of Rumphius, 1705 p. 32, I, pl. xiii figs. 1, 2 and D, Engel p. 212–213 photo 23 figs. 6, 16, 10, 12, 13; *H. mammillatus*, Gillett & McNeill pl. xcv fig. 1, Utinomi p. 116 pl. lviii fig. 9.

†*Heterodiadema ouramense*, Moura pp. 69–71 pl. iii figs. 1, 2.

†*Holaster* p. 65, with *H. cinctus* pp. 65–66 pl. xxvii figs. 1–5, Cooke; *H. lerichei*, Ferreira Soares (1) p. 20 pl. v figs. 5, 6, (2) pp. 150–151 pl. v figs. 5, 6; *H. complanatus* pp. 48–49 pl. i fig. 4, *prestensis* pp. 49–50 pl. ii fig. 1, Mitrović-Petrović.

*Laganum laganum* 'may well be' the 'second species' of Rumphius, 1705, p. 37 pl. xiv fig. E, Engel pp. 216–217 photo 24 fig. 11.

†*Laganum* p. 50, with *L. floridanum* pp. 50–51 pl. xx figs. 8–10, *ocalanum* p. 51 pl. xx figs. 11–15, Cooke.

*Leodia* p. 46, with *L. sesziesperforata* pp. 46–47 pl. xix figs. 4, 5, Cooke.

†*Leodia caroliniana*, Cooke p. 47 pl. xix figs. 1–3.

†*Linthia* p. 69, with *L. alabamensis* pp. 69–70 pl. xxix figs. 5–7, *hanoverensis* p. 70 pl. xxix figs. 8–12, *L. ? prima* p. 70 pl. xliii figs. 1–4, *wilmingtonensis* p. 69 pl. xxix figs. 1–4, Cooke.

*Lovenia elongata*, Utinomi p. 119 pl. lx fig. 3.

†*Lovenia* p. 77, with *L. alabamensis* sp. nov. Oligocene Alabama, U.S. p. 77 pl. xxxii figs. 14–17, *clarki* pp. 77–78 pl. xxxiii fig. 6, Cooke.

*Lytechinus variegatus*, Cooke, p. 15 pl. ii figs. 12–13.

†*Lytechinus* pp. 14-15, with *L. floralanus* p. 15 pl. ii figs. 17-21, variegatus Pleistocene and Recent p. 15 pl. ii figs. 12-13, Cooke.

*Macropneustes ventricosus*, Cooke p. 84 pl. xxxvii figs. 1-4.

†*Macropneustes* pp. 82-83, with *M. mortoni* pp. 83-84 pl. xxxvii figs. 5-9, Cooke.

†*Marelia* pp. 80-81, with *M. arguta* p. 81 pl. xxxiv figs. 1-4, *subrostrata* p. 81 pl. xxxiv figs. 5, 6, Cooke.

*Mellita* pp. 45-46, with *M. quinquesperforata* p. 46 pl. xix figs. 6, 7, Pleistocene and Recent, *quinquesperforata tenuis* p. 46, Cooke.

†*Mellita quinquesperforata*, Cooke, p. 46 pl. xix figs. 6, 7.

*Meoma* Gray 1851 a synonym of *Macropneustes* Agassiz in Agassiz and Desor 1847, Cooke, p. 83.

*Mespilia globulus*, Tahara, Okada & Kobayashi pp. 166-168 figs. 1, 2 pl. vii figs. 1, 2, Utinomi p. 114 pl. lvii fig. 8.

*Metalia spatagus*, identity of Rumphius', 1705, pl. xiv, fig. 1, Engel p. 215 photo 24 fig. 10.

†*Micraster*, possible identity of Rumphius', 1705, pl. lix fig. F, Engel p. 223; *Micraster* pp. 401-427 with *M. coranguinum* figs. 40-43, 45, *senonensis* fig. 46, Nichols (2).

*Moiria* p. 73, with *M. atropos* Pleistocene and Recent pp. 73-74 pl. xxx figs. 1-4, Cooke; *M. atropos*, Tommasi p. 5-6 pl. i fig. 3.

†*Moiria atropos*, Cooke pp. 73-74 pl. xxx figs. 1-4.

†*Mortonella* Pomel 1883 a synonym of *Periarthus* Conrad 1866, Cooke, pp. 41, 44.

†*Neolaganum* p. 51, with *N. durhami* sp. nov. Eocene Florida U.S. p. 52 pl. xxi figs. 5-7, dalli pp. 51-52 pl. xxi figs. 1-4, Cooke.

*Neolampas rostellata*, Tortonese (1) p. 292.

'Oculus Polipheni' of Rumphius 1705 p. 31, IV, unidentifiable, Engel pp. 211, 212.

†*Oligopygus* pp. 27-28, with *O. haldemani* p. 29 pl. viii figs. 6-8, *rotundus* pp. 29-30 pl. viii figs. 1-5, *wetherbyi* p. 28 pl. viii figs. 9-12, Cooke.

†*Orthopsis* sp., Ferreira Soares (1) p. 20 pl. v fig. 7, (2) p. 150 pl. v fig. 7.

*Paracentrotus gaimardi*, Cherbonnier (3) pp. 48-49 pl. vi figs. G-K pl. vii figs. A-J; *P. lividus*, Crisp & Fischer-Piette pp. 327-328, Sebastio p. 99 figs. 1-4, Tortonese (1) p. 292.

†*Paraster* p. 71, with *P. americanus* p. 72 pl. xxx figs. 5-8, *armergi* pp. 71-72 pl. xxx figs. 13-15, Cooke.

†*Periarthus* p. 41 with key to spp. from eastern U.S., *P. lyelli* pp. 41-42 pl. xiii fig. 1 pl. xiv figs. 1-3, *lyelli floridanus* p. 42 pl. xiii fig. 4, *lyelli pileus-sinensis* p. 42 pl. xiii figs. 2, 3, *protuberans* pp. 42-43 pl. xii figs. 7-9, *quinquefarius* pp. 43-44 pl. xiv figs. 6-8, *quinquefarius kewi* p. 44 pl. xiv figs. 4, 5, Cooke.

*Peronella japonica* p. 117 pl. lix fig. 5, *minuta* p. 117 pl. lix fig. 4, Utinomi.

*Phyllacanthus parvispinus*, Sinclair p. 4 fig.

†*Phyllacanthus* pp. 10-11 with *P. mortoni* pp. 11-12 pl. i figs. 15-17, Cooke.

†*Phymosoma ornatissimum*, possible identity of Rumphius', 1705, pl. lix fig. 6, Engel p. 222 photo 23 fig. 5.

†*Phymotaxis* p. 24, with *P. mansfeldi* p. 24 pl. vi figs. 4-8, Cooke.

*Plagiobrissus grandis*, Cooke pp. 86-87 pl. xxxix figs. 1, 2 pl. xl fig. 6, Tommasi p. 7 pl. i fig. 4.

†*Plagiobrissus* p. 86, with *P. curvus* pp. 87-88 pl. xxxix figs. 3-6, *P. ? dixie* p. 87 pl. xl figs. 1-5, *P. ? holmesii* p. 87, Cooke.

†*Porpitella* p. 33, with *P. micra* p. 33 pl. vii figs. 5-7, Cooke.

*Prionocidaris baculosa* var. *annulifera*, Utinomi p. 113 pl. lvii fig. 1.

†*Protoscutella* p. 38, with *P. conradi* pp. 39-40 pl. xv figs. 4, 5, *mississippiensis* pp. 38-39 pl. xv figs. 12, 13, *pentagonium* p. 39 pl. xv figs. 6-8, *plana* p. 40 pl. xv figs. 1-3, *tuomeyi* p. 39 pl. xv figs. 9-11, Cooke.

†*Psammochinus* p. 16 with *P. philanthropus* pp. 16-17 pl. iii figs. 1-2, *santee* p. 17 pl. iii figs. 3-4, Cooke; *P. cf. salvensis*, Mitrović-Petrović p. 48 pl. i fig. 3.

*Pseudocentrotus depressus*, Utinomi p. 115, pl. lviii fig. 4.

†*Pseudodiadema jacardi* pp. 47-48 pl. i fig. 1, *raulini* pp. 46-47 pl. i fig. 2, Mitrović-Petrović.

†*Pygaulus demoulinii* p. 53 pl. iii fig. 2, *ovatus* p. 54 pl. iii fig. 3, Mitrović-Petrović.

†*Pygomalus analis* pp. 340-341 fig. 1A, *ovalis* p. 340 pl. i figs. 1, 2, Jesionek-Szymanska.

†*Pygorrhysis ringens*, Jesionek-Szymanska p. 341 fig. 1B.

†*Pyrina cylindrica* p. 51 pl. ii fig. 3, *loewis* pp. 52-53 pl. iii fig. 1, *pygea* pp. 51-52 pl. ii fig. 4, Mitrović-Petrović.

†*Rhopostoma* gen. nov. family Echinoneidae, for type *Ananchytes cruciferus* Morton 1830, p. 26, *R. cruciferus* p. 26 pl. vii figs. 1-4, Cooke.

*Rutula orbiculus*, Cherbonnier (3) p. 49 pl. vii fig. K; *R. orbiculus*, identity of Rumphius' pl. xiv fig. 1, Engel p. 217 photo 24 fig. 5.

†*Salenia* p. 13 with *S. tumidula* p. 13 pl. ii figs. 1-7, Cooke.

*Salmacis bicolor*, Halstead fig. 25 (pedicellariae); *S. sphaeroides*, Gillett & McNeill pl. xcv fig. 2.

†*Santeelampas* gen. nov. family Cassidulidae, for type *Catopygus oviformis* Conrad 1850, p. 61, *S. oviformis* pp. 61-62 pl. xxvi figs. 1-8, Cooke.

*Scaphechinus brevis* p. 118 pl. lix fig. 7, *mirabilis* p. 118 pl. lix fig. 8, *tenuis* pp. 117-118 pl. lix fig. 6, Utinomi.

*Schizaster canaliferus*, Tortonese (1) p. 292; *S. edwardsi*, Cherbonnier (3) pp. 50-51 pl. viii figs. F-L; *S. lacunosus*, identity of Rumphius', 1705, pl. xiv fig. 2, Engel pp. 215-216 photo 24 fig. 12; *S. lacunosus*, Utinomi p. 119 pl. lx fig. 4.

†*Schizaster* p. 72, with *S. (Brachybrissus)* p. 73, *S. (Brachybrissus) ocalanus* p. 73 pl. xxix figs. 13-17, Cooke.

*Spalangus purpureus*, Cherbonnier (3) p. 50 pl. viii figs. A-E, Tortonese (1) p. 292, Nichols (2) pp. 353-354 363-368, 374-375 figs. 1a-c, 4a-c, 7a-c, 12, 14, 15 (part), 20, 31, *raschi* pp. 355, 373-374, 376-377 figs. 2a-c, 5a-c, 8a-c.

†*Spatangus* p. 80, with *S. glenni* sp. nov. Miocene S. Carolina, U.S. p. 80 pl. xxxv figs. 1-5, Cooke.

*Sphaerechinus granularis*, Sebastio p. 100 figs. 5, 6.

*Stomopneustes variolaris*, Utinomi p. 113 pl. lvii fig. 3.

*Strongylocentrotus* p. 25, with *S. dröbachiensis* p. 25 pl. vi fig. 3, **Cooke**, also **Madsen** (2) p. 169 fig. 5 (holotype), **Scheffer** pp. 373-374 fig. 5; *S. pallidus*, **Tambs-Lyche** pp. 10-11.

*Stylocidaris affinis*, **Tortonese** (1) p. 291; *S. lineata*, **Cherbonnier** (1) p. 367.

*Temnopleurus reevesi* p. 114 pl. lvii fig. 11, *toresmaticus* p. 114 pl. lvii fig. 10, **Utinomi**.

*Temnotrema sculptum*, **Utinomi** p. 114 pl. lvii fig. 9.

†*Trematopygus crucifer* (Morton) made the type of a new genus *Rhopostoma* by **Cooke** p. 26.

*Triploneustes* p. 15 with *T. ventricosus* pp. 15-16 pl. ii figs. 14-16, **Cooke**; *T. gratilla*, **Alcala** pl. i; *T. gratilla*, identity of 'Echinus esculentus' of Rumphius 1705 p. 31, 1, **Engel** pp. 210-211; *T. gratilla*, **Gillett & McNeill** pl. cliii, **Tahara, Okada & Kobayashi** pp. 168-169 fig. 3 pl. vii figs. 5, 6, **Utinomi** p. 115 pl. lviii fig. 2.

†*Toxaster amplus*, **Kotetishvili** pp. 20-21 pl. i figs. 2a-c.

*Toxopneustes chlorocanthus*, **Alcala** pl. iii; *T. elegans*, **Halstead** fig. 23; *T. pileolus*, **Tahara, Okada & Kobayashi** p. 168 pl. vii figs. 3, 4, **Utinomi** p. 115 pl. lviii fig. 1.

†*Tylocidaris macneili* pp. 12-13 pl. i figs. 3-5, *T. ? salina* p. 12 pl. i figs. 12-14, both spp. nov. Paleocene Alabama, U.S., *T. walcotti* p. 12 pl. i figs. 7-9, **Cooke**.

†*Unifascia* gen. nov. family Unifasciidae, for type *Macropneustes carolinensis* **Clark** 1915, pp. 79-80, *U. carolinensis* p. 80 pl. xxxiv figs. 7-13, **Cooke**.

Unifasciidae fam. nov., presumably order Spatangoida, for genus *Unifascia* nov., **Cooke** p. 79.

†*Weisbordella* p. 53, with *W. cubae* pp. 53-54 pl. xx figs. 1-4, *johnsoni* pp. 54-55 pl. xx figs. 5-7, **Cooke**.

†*Wythella* pp. 52-53, with *W. eldridgei* p. 53 pl. xxi figs. 8-10, **Cooke**.

#### †SOMASTEROIDEA

[Vacant]

#### ASTEROIDEA

*Acanthaster planci*, identity of 'Stella marina quindecim radiorum' of Rumphius, 1705, **Engel** pp. 218-219; *A. planci*, **Gillett & McNeill** pl. lxxxix (coloured), **Utinomi** p. 110 pl. lv fig. 7.

*Allostichaster insignis* p. 142 figs. 39, 40, *polyplax* p. 142 fig. 38, **Fell**.

*Anareaster* gen. nov., family Korethrasteridae, for type *A. ganymede* sp. nov. MacRobertson Land, Antarctica, **Fell & Clark**, H. E. pp. 185-186 figs. 1-3.

*Anthenoides granulatus*, **Fell** p. 135.

*Asterias amurensis*, **Scheffer** p. 372 fig. 3, **Utinomi** p. 110 pl. lv fig. 9.

*Asterias aucklandensis* p. 138 fig. 23A, *novaezelandiae* p. 138, *regularis* p. 138 fig. 23, **Fell**; *A. batheri* p. 109 pl. lv fig. 4, *coronata japonica* p. 109 pl. lv fig. 3, *pectinifera* pp. 109-110 pl. lv fig. 5, **Utinomi**.

*Asterodiscus truncatus*, **Fell** p. 135 fig. 17.

*Asterodon dilatatus* p. 134 fig. 10, *miliaris* p. 134 fig. 8, *robustus* p. 134 figs. 9, 14, **Fell**.

*Astropecten duplicatus* pp. 108-109 fig. 1, *richardi* pp. 110-111 fig. 2, **Cherbonnier** (1); *A. dubiosus*, *polyacanthus* p. 131, *primigenius* p. 131 fig. 6, **Fell**; *A. aranciatus*, **Madsen** (2) pp. 165, 167, notes on the holotype; *A. armatus brasiliensis* pp. 12-13 pl. ii fig. 3,

*armatus riensis* pp. 13-14 pl. ii fig. 4, *marginatus* p. 14 pl. ii fig. 5, **Tommasi**; *A. irregularis pentacanthus*, **Tortonese** (1) p. 290; *A. latespinosus* p. 107 pl. liv fig. 3, *polyacanthus* p. 107 pl. liv fig. 2, *scoparius* p. 107 pl. liv fig. 1, **Utinomi**.

*Astrostole scabra*, **Fell** p. 140 fig. 41.

*Benthopecten pentacanthus*, **Fell** p. 134.

*Brisingines delli*, **Fell** p. 140 fig. 33.

*Calvasterias laevigata* p. 142, *suteri* p. 142 fig. 42, **Fell**.

*Certonardoa semiregularis*, **Utinomi** p. 109 pl. lv fig. 1.

*Cheiraster richardsoni*, **Fell** p. 134 fig. 30.

*Chondraster* a subgenus of *Porania* with *C. hermanni* sp. nov. East Greenland, **Madsen** (1) pp. 153-160 figs. 1-4, *C. elatosis* probably not specifically distinct from *grandis* pp. 156, 157.

*Coscinasterias calamaria*, **Fell** p. 142 fig. 37; *C. acutispina*, **Utinomi** p. 110 pl. lv fig. 8.

*Cosmasterias dyscrita*, **Fell** p. 142 figs. 31, 35.

*Crossaster japonicus*, **Fell** p. 139 fig. 27.

*Culcita novaeguineae*, **Gillett & McNeill** pl. lxxxix (coloured), **Utinomi** p. 108 pl. lv fig. 9.

*Dipsacaster magnificus*, **Fell** p. 132 fig. 3.

*Echinaster echinophorus*, **Cherbonnier** (1) pp. 171-172 fig. 3C, D; *E. farquhari*, **Fell** p. 139 fig. 24; *E. antonioensis* p. 22 pl. iv fig. 2, *brasiliensis* pp. 22-23 pl. iv fig. 3, *sensus* pp. 23-24 pl. iv fig. 4, *spinulosus* pp. 21-22 pl. iv fig. 1, **Tommasi**; *E. sepositus*, **Tortonese** (1) p. 291.

*Eurygonias hylacanthus*, **Fell** pp. 134-135 figs. 11, 15.

*Fromia* sp., **Gillett & McNeill** pl. lxxxviii.

*Goniaster americanus*, **Cherbonnier** (1) pp. 107-108.

*Goniidiscaster scaber* with synonym *Asterias articulata* Linnaeus 1753, **Madsen** (2) pp. 165-167 fig. 2 (type of *articulata*).

*Hacelia attenuata*, **Tortonese** (1) p. 291.

*Henricia compacta* etc. p. 139 fig. 25, *ralphae* p. 139 fig. 26, **Fell**; *H. ohshimai*, **Utinomi** p. 110 pl. lv fig. 6.

*Hippasteria trojana*, **Fell**, pp. 136, 138 fig. 21.

†*Hudsonaster wardi* sp. nov. Devonian Pennsylvania, U.S., **Cramer**, pp. 471-473 fig. 1.

*Leister leachi*, **Utinomi** p. 109 pl. lv fig. 2.

*Linckia laevigata*, identity of 'common species' of Rumphius, 1705 p. 39 and pl. xv fig. E, **Engel** p. 218 photo 25 fig. 2; *L. laevigata*, **Gillett & McNeill** pl. xc (coloured); *L. guildingii*, **Tommasi** pp. 17-18 pl. iii fig. 3; *L. guildingii*, **Utinomi** p. 108 pl. liv fig. 6.

*Luidia barbadensis* pp. 170-171 fig. 3 B, E, fig. 4, *clathrata* p. 170, *senegalensis* pp. 169-170, **Cherbonnier** (1); *L. neozelandica* p. 132 fig. 7, *varia* p. 132, **Fell**; *L. clathrata* p. 9 pl. ii fig. 1, *senegalensis* pp. 9-11 pl. ii fig. 2, **Tommasi**; *L. maculata* p. 108 pl. liv fig. 7, *quinaria* p. 108 pl. liv fig. 8, **Utinomi**.

*Mediaster sladeni*, **Fell** p. 136 fig. 19.

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